GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA

Monthly Progress Report

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EREP Investigation 380

Contract NAS9-13394

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INTRODUCTION

The primary objective of the CSM Skylab Program is to analyze EREP data for geologic information. To this end, the research has been subdivided into the following tasks;

Task I. The PI shall assist NASA/MSC in mission planning activities related to the proposed investigation.

Task II. The investigator will screen all EREP data obtained over Colorado and will select frames for detailed study.

Task III. The investigator will prepare photogeologic maps using selected S-190 photographs, and will analyze them to determine what geologic information may be contained in them.

Task IV. The geological interpretations obtained in Task 3 will be compared to interpretations obtained from S-192 imagery, and to interpretations made from ERTS-I imagery.

Task V. The geological interpretations will be verified by means of interpretation of aerial photographs, published geological reports, and field observations.

Task VI. The investigator will prepare recommendations for the optimum type, scale, and resolution of imagery to be used for studies of regional geology and exploration for mineral deposits and water resources.

Progress

Overall Status

At this time, the progress of the research is as anticipated with the time-extension to 30 June 1975. The only aspect of the research in jeopardy is evaluation of S192 data due to lack of receipt of processed imagery.

Past Month's Activity

Work continued on updating the two technical papers for submission to professional journals. One paper will be submitted during the next reporting period (to Photogrammetric Engineering), and the second should be submitted in January 1975.

Cloud-cover statistics can be used to minimize chances of cloudiness on earth resources surveys. Minimum cloud cover over central Colorado occurs in the morning during September. Repetitive coverage increases the probability of a cloud-free survey.

Cloud-cover studies over central Colorado show that the least average monthly cloud cover during the daylight hours occurs during September (40-50%), then October (40-60%), then June (50-60%). Greaves, et al. (1970) developed curves indicating that five satellite passes over an area 300 nautical miles in diameter have a 95% probability of obtaining 50% cloud-free coverage; twelve passes give a 95% probability of obtaining 90% cloud-free coverage. From May to August in central Colorado, clouds are caused by convective heating of the atmosphere due to long days and high sun angle. For this reason clouds commonly begin to fill a clear sky at midmorning. Clouds form later in the day during the winter.

Rocks appearing "pink" on satellite and aerial photography over the Weston Pass study area are exposed as talus or outcrops and contain microcline and/or iron oxides. The most obvious color anomaly contains both microcline (30-40%) and hematite/limonite-rich (2-10%) granite talus. One less visible anomaly consists of iron-stained (greater than 2%) dolomite talus; another consists of microcline-rich (greater than 30%) granite outcrop and grus. Outcrops and vegetation-free talus and soil provide optimum visibility. Red color is not obvious in every place these conditions are met: some proposed reasons for this may be indirect illumination or poor photo-processing.

Alteration in the study area includes sericitization and argillization of rhyolite porphyry intrusives, dolomite and silica replacement of limestones and primary dolomites, and weathering of primary pyrite, magnetite, and hematite to hematite and limonite. The only alteration discriminated in some cases on satellite photography was hematite/limonite.

Thin section analysis shows pyrite-magnetite-hematite-limonite mineralization in the Weston Pass study area fills fractures found in all rock types; is disseminated in rhyolite porphyries; accompanies replacement silica (jasperoid) in sandstones, limestones, and dolomites; and forms euhedral crystals in rhyolite porphyry, primary dolomites, and pelitic shales. The ore deposit at Weston Pass consisted of lead and zinc replacement in a brecciated, silicified, and dolomitized limestone. Precipitation of ores was controlled by permeable and chemically reactive horizons. Sources of the hydrothermal ore-bearing fluids include fractures (feeder channels) in the underlying rock and permeable fault zones. The ultimate source is probably associated with Laramide-age rhyolite porphyry intrusives that have been mapped locally as pipes, dikes, and sills.

Photointerpretation of Skylab photos in the Pikes Peak batholith identified no pegmatites, the main source of potentially economic minerals, probably because they are covered and/or lack unique color and weathering characteristics.

Intensive photointerpretation of Skylab S190B color photos over southwestern Colorado-southeastern Utah continued in November. Because geologic information appears to be greater than can be mapped at 1:250,000 scale, attempts are being made to annotate information on ~1:250,000 and ~1:125,000 enlarged transparencies, for compilation onto base maps at 1:100,000 and 1:62,500. These studies should provide information on the limitations of effective photogeologic interpretation.

Planned Activities for Current Month

Research in December will continue on those projects outlined above.

Travel

There was no travel in November, and none is anticipated in December.

Outlook and Recommendation

Progress continues to be satisfactory and the project should be completed on schedule.

Keenan Lee
Principal Investigator